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Docket No. 99-039-TAP

**SECURE GATEWAY MULTIPLE AUTOMATED DATA STORAGE SYSTEM  
SHARING**

**BACKGROUND OF THE INVENTION**

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**1. Technical Field:**

The present invention relates generally to electronic media storage and retrieval and in particular to an improved method and apparatus for automating the movement of data storage units from one automated data storage system to another.

**2. Description of Related Art:**

Storage library systems are capable of storing and rapidly retrieving large quantities of information stored in storage media cartridges. Such storage library systems often use robotic mechanisms to improve the speed of information retrieval and reliability of maintaining the storage library cartridge inventory.

An automatic cartridge library is a system used for handling large amounts of information in a data processing system. These types of systems store and manage large numbers of standardized cassettes containing magnetic tape on which data is recorded. Typically, an automated cartridge library is comprised of arrays of uniquely identified cells in which each cell contains a single tape cartridge. These cells are arranged in

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arrays or racks for holding many of these cartridges.

Each cartridge has identifying information, such as, for example, a bar code. A robotic arm, having an optical system for selecting the correct cartridge, is operable

- 5 within the automated cartridge library to locate a particular cell, retrieve a tape cartridge from the cell, convey the tape cartridge to a tape drive, and insert the tape cartridge into a tape drive.

For years now magnetic tape cartridges have proven  
10 to be an efficient and effective medium for data storage, including backing up data from primary storage devices and acting as primary storage devices for infrequently accessed data. A tape cartridge is a housing containing magnetic tape. The tape cartridge, which is also  
15 referred to as a "tape", may be wound onto one or more reels within the housing.

Large computer systems have a need to access numerous cartridges. To this end, automated cartridge handling systems or libraries for cartridges have been  
20 developed for making the cartridges automatically available to the computer. Many of these automated libraries resemble jukeboxes. These automated libraries are also referred to as "automated cartridge systems" and may contain thousands of cartridges within a single  
25 automated cartridge system. The cartridges within an automated cartridge system are accessed using automated or robotic systems. In some systems, a robotic arm moves

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around within a housing containing cartridges stored in array holders or slots and moves the cartridges. The robotic arm is used to move a cartridge from the array to a tape drive. The robotic arm also is used to remove a 5 cartridge from a tape drive and place the cartridge back into the array. These automated libraries also include automated mechanisms to introduce and remove tape cartridges from the library.

Automated data storage library systems provide a 10 means for large quantities of information to be efficiently stored and retrieved by external systems. These systems generally include one or more robotic units that move data storage media to and from read/write devices where the information can be accessed. In order 15 to control these movements, the precise location of the robotic mechanisms within the library relative to the data storage media and the read/write devices must be known. An example of such a system is a tape library. In this case, tape cartridges are stored in specific 20 locations within a structure, and a robotic unit moves about the structure, transferring cartridges to and from tape drives where the information can be accessed by an external host.

Many of these automated cartridge systems are 25 accessed through a network. The network client protocols for these automated cartridge systems are often proprietary and are not easy to develop, port, maintain,

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and extend. Currently, access to an automated cartridge system from a client location requires installation of software encompassing the proprietary protocol. Porting the protocols to different platforms to control these 5 automated cartridge systems is difficult, especially in view of the many different types of platforms that have to be supported for different customers.

In many applications, the amount of data is large enough that multiple library storage modules are employed 10 in which each module contains cell arrays and a robotic arm, but does not require additional host computers and does not contain a tape drive. These multiple library storage units are typically arranged adjacent to one another and pass-through ports are provided for passing 15 tape cartridges from one library storage module to an adjacent library storage module. In these systems, a problem exists in automated library systems to facilitate loading and unloading of cartridges when the number of cartridges and drive devices are greater than some 20 threshold of reasonable performance.

Within certain intelligence communities, there exist a number of separate networks carrying, for example, unclassified, secret and top secret data. The rules governing network security may be typically set by a 25 government security agency, such as, for example, the National Security Agency (NSA) who, without exception may not allow any of the three networks to communicate with

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each other over known communication paths, such as, via electronic, fibre, firewalls and the like. The method data is transmitted presently is that a user creates two data cartridges, one of the data cartridges remains in

5 its current environment and the second data cartridge may be hand carried to the next security level where it is catalogued into the security system and never returned to its origination point. Consequently, any data passing from one security level to the next higher security level

10 is manual, which is inherently slow and costly considering the secure environments. In addition, any time a data cartridge is created and passed up to the next level of security, the site at which the cartridge is delivered ensures that the data cartridge is never

15 inadvertently or otherwise returned to a lower security level. The logistics involved with manual handling and transportation of secure date is staggering.

In addition, a user faced with greater than sixteen library storage modules (LSMs) requires even more manual intervention. Presently, within some organizational frameworks, anyone wishing to share cartridges in multiple LSMs within an automated cartridge system (ACS) must have a shared control data set (CDS) in Automated Cartridge System Library Server (ACSLS) or a third party catalogue. Since a shared server may be required to connect to an unclassified and classified network,

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security personnel within security agencies may not authorize the server connection. Although firewalls may be installed in a local area network (LAN) connection, the security personnel still may not authorize the 5 connection between the two networks. Even if there was the remotest possibility that the system could be compromised by allowing secret or top secret data to be transferred back to the unclassified system, security personnel would not authorize the connection between the 10 unclassified and classified networks.

Therefore, any sharing of data must be accomplished without sharing the ACSLS or any type of LAN/WAN connections between the LSM. Additionally, if allowed, any such connections must only allow data to flow to a 15 higher security level but not allow data to flow to a lower security level.

Therefore, it would be advantageous to have an improved method and apparatus for addressing security issues of transmission of data between an unclassified 20 and classified network. It would also be advantageous to have an improved method and apparatus for allowing the expansion beyond sixteen library storage modules without major revisions to the host software component (HSC).

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**SUMMARY OF THE INVENTION**

The present invention provides secure gateway  
5 multiple automated data storage system sharing. Data is  
transmitted from a first data storage unit within a first  
automated data storage system to a second data storage  
unit. A request is then received from a second data  
storage system for the second data storage unit. The  
10 second data storage unit is then transported to the  
second data storage system.

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**BRIEF DESCRIPTION OF THE DRAWINGS**

The novel features believed characteristic of the  
5 invention are set forth in the appended claims. The  
invention itself, however, as well as a preferred mode of  
use, further objectives and advantages thereof, will best  
be understood by reference to the following detailed  
description of an illustrative embodiment when read in  
10 conjunction with the accompanying drawings, wherein:

**Figure 1** depicts a pictorial representation of a  
distributed data processing system in which the  
present invention may be implemented;

15 **Figure 2** depicts a block diagram of a data  
processing system which may be implemented as a server,  
in accordance with the present invention;

**Figure 3** depicts a block diagram of a data  
processing system in which the present invention may be  
implemented;

20 **Figure 4** is a block diagram illustrating data flow  
paths used to transfer data between a primary storage  
system and a secondary storage system in accordance with  
a preferred embodiment of the present invention;

25 **Figure 5** is a block diagram of a mass storage system  
which operates with shared catalogues in accordance with a  
preferred embodiment of the present invention;

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**Figure 6** is a block diagram of a mass storage system which operates with separate catalogues in accordance with a preferred embodiment of the present invention;

5      **Figure 7** is an exemplary flowchart illustrating a gateway pass through port (GPTP) in accordance with a preferred embodiment of the present invention;

**Figure 8** is an exemplary flowchart illustrating a source automatic cartridge system in accordance with a preferred embodiment of the present invention; and

10     **Figure 9** is an exemplary flowchart illustrating a destination automatic cartridge system in accordance with a preferred embodiment of the present invention.

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**DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT**

With reference now to the figures, and in particular  
5 with reference to **Figure 1**, a pictorial representation of  
a distributed data processing system is depicted in which  
the present invention may be implemented.

Distributed data processing system **100** is a network  
of computers in which the present invention may be  
10 implemented. Distributed data processing system **100**  
contains network **102**, which is the medium used to provide  
communications links between various devices and  
computers connected within distributed data processing  
system **100**. Network **102** may include permanent  
15 connections, such as wire or fiber optic cables, or  
temporary connections made through telephone connections.  
In the depicted example, server **104** is connected to  
network **102**, along with storage unit **106**. In addition,  
clients **108**, **110** and **112** are also connected to network  
20 **102**. These clients, **108**, **110** and **112**, may be, for  
example, personal computers or network computers.

For purposes of this application, a network computer  
is any computer coupled to a network that receives a  
program or other application from another computer  
25 coupled to the network. In the depicted example, server  
**104** provides data, such as boot files, operating system  
images, data from databases or specific files used by

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applications, and executable modules of applications, to clients 108-112. Clients 108, 110 and 112 are clients to server 104. Distributed data processing system 100 may include additional servers, clients, and other devices 5 not shown. Distributed data processing system 100 also includes printers 114, 116 and 118. A client, such as client 110, may print directly to printer 114. Clients such as client 108 and client 112 do not have directly attached printers. These clients may print to printer 10 116, which is attached to server 104, or to printer 118, which is a network printer that does not require connection to a computer for printing documents. Client 110, alternatively, may print to printer 116 or printer 118, depending on the printer type and the document 15 requirements.

In the depicted example, distributed data processing system 100 is the Internet, with network 102 representing a worldwide collection of networks and gateways that use the TCP/IP suite of protocols to communicate with one 20 another. At the heart of the Internet is a backbone of high-speed data communication lines between major nodes or host computers consisting of thousands of commercial, government, education, and other computer systems that route data and messages. Of course, distributed data 25 processing system 100 also may be implemented as a number of different types of networks such as, for example, an intranet or a local area network. **Figure 1** is intended

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as an example and not as an architectural limitation for the processes of the present invention.

Referring to **Figure 2**, a block diagram of a data processing system which may be implemented as a server, such as server 104 in **Figure 1**, is depicted in accordance with the present invention. Data processing system 200 may be a symmetric multiprocessor (SMP) system including a plurality of processors 202 and 204 connected to system bus 206. Alternatively, a single processor system may be employed. Also connected to system bus 206 is memory controller/cache 208, which provides an interface to local memory 209. I/O bus bridge 210 is connected to system bus 206 and provides an interface to I/O bus 212. Memory controller/cache 208 and I/O bus bridge 210 may be integrated as depicted.

Peripheral component interconnect (PCI) bus bridge 214 connected to I/O bus 212 provides an interface to PCI local bus 216. A number of modems 218-220 may be connected to PCI bus 216. Typical PCI bus implementations will support a specific number (often in the range of two to seven) of PCI expansion slots or add-in connectors. Communications links to network computers 108-112 in **Figure 1** may be provided through modem 218 and network adapter 220 connected to PCI local bus 216 through add-in boards.

Additional PCI bus bridges 222 and 224 provide interfaces for additional PCI buses 226 and 228, from

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which additional modems or network adapters may be supported. In this manner, server 200 allows connections to multiple network computers. A memory mapped graphics adapter 230 and hard disk 232 may also be connected to

- 5 I/O bus 212 as depicted, either directly or indirectly. Those of ordinary skill in the art will appreciate that the hardware depicted in **Figure 2** may vary. For example, other peripheral devices, such as optical disk drives and the like, also may be used in addition to or in place of  
10 the hardware depicted. The depicted example is not meant to imply architectural limitations with respect to the present invention.

The data processing system depicted in **Figure 2** may be, for example, an IBM RS/6000, a product of  
15 International Business Machines Corporation in Armonk, New York, running the Advanced Interactive Executive (AIX) operating system.

With reference now to **Figure 3**, a block diagram of a data processing system in which the present invention may  
20 be implemented is illustrated. Data processing system 300 is an example of a client computer. Data processing system 300 employs a peripheral component interconnect (PCI) local bus architecture. Although the depicted example employs a PCI bus, other bus architectures, such  
25 as Micro Channel and ISA, may be used. Processor 302 and main memory 304 are connected to PCI local bus 306 through PCI bridge 308. PCI bridge 308 may also include

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an integrated memory controller and cache memory for processor 302.

Additional connections to PCI local bus 306 may be made through direct component interconnection or through 5 add-in boards. In the depicted example, local area network (LAN) adapter 310, SCSI host bus adapter 312, and expansion bus interface 314 are connected to PCI local bus 306 by direct component connection. In contrast, audio adapter 316, graphics adapter 318, and audio/video 10 adapter (A/V) 319 are connected to PCI local bus 306 by add-in boards inserted into expansion slots. Expansion bus interface 314 provides a connection for a keyboard and mouse adapter 320, modem 322, and additional memory 324. In the depicted example, SCSI host bus adapter 312 15 provides a connection for hard disk drive 326, tape drive 328, CD-ROM drive 330, and digital video disc read only memory drive (DVD-ROM) 332. Typical PCI local bus implementations will support three or four PCI expansion slots or add-in connectors.

20 An operating system runs on processor 302 and is used to coordinate and provide control of various components within data processing system 300 in **Figure 3**. The operating system may be a commercially available operating system, such as AIX, which is available from 25 International Business Machines Corporation. "AIX" is a trademark of International Business Machines Corporation. An object oriented programming system, such as Java, may

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run in conjunction with the operating system, providing calls to the operating system from Java programs or applications executing on data processing system 300.

Instructions for the operating system, the object-

- 5 oriented operating system, and applications or programs are located on a storage device, such as hard disk drive 326, and may be loaded into main memory 304 for execution by processor 302.

Those of ordinary skill in the art will appreciate 10 that the hardware in **Figure 3** may vary depending on the implementation. For example, other peripheral devices, such as optical disk drives and the like, may be used in addition to or in place of the hardware depicted in **Figure 3**. The depicted example is not meant to imply 15 architectural limitations with respect to the present invention. For example, the processes of the present invention may be applied to multiprocessor data processing systems.

The present invention provides a secure data storage 20 unit gateway system. In the following figures a tape cartridge data storage unit is described using a automated tape cartridge storage system. However, many modifications and variations will be apparent to those of ordinary skill in the art. For example, any type of data 25 storage unit may be used in implementing the present invention, such as, for example, CD-ROMS, DVDs and the like.

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In the following example, tape cartridges may be transferred from one automatic tape cartridge system to another automatic tape cartridge system. The automatic tape cartridge systems may have separate automated cartridge system library servers with no physical connection between them except, for example, a pass-through port. A user may create at least two tape cartridges in an unclassified library storage module silo. One of the tape cartridges remains in a first library storage module silo while a second tape cartridge is moved to an adjoining second classified library service module. This operation may be totally automatic. The unclassified library storage module places the second tape cartridge into a gateway pass-through port between the library storage modules. The second tape cartridge transferred to the classified library storage module receives the second tape cartridge through its gateway pass-through port. The second library storage module may then have the option of either mounting or shelving the tape cartridge.

Figure 4 depicts a block diagram illustrating data flow paths used to transfer data between a primary storage system and a secondary storage system is depicted in accordance with a preferred embodiment of the present invention. Primary storage system 400 sends data to secondary storage system 402 each time data is written to primary storage system by a data processing system, such

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as network 102 in **Figure 1**. Primary storage 400 and secondary storage 402 may be implemented using a storage system, such as, for example, storage system 106 in **Figure 1**.

5 Primary storage system 400 in this example includes a first set of volumes, volumes 404-408. Secondary storage system 402 includes a second set of volumes, volumes 410-414, which correspond to the first set of volumes in primary storage 400. The correspondence 10 between the volumes in these two storage systems is set up in pairs, such that a volume in primary storage system 400 has a corresponding volume in secondary storage system 402 to form the pair. For example, volume 404 is paired with volume 410, volume 406 is paired with volume 15 412, and volume 408 is paired with volume 414.

Further, primary storage system 400 includes a primary data bridge 416 and a secondary status bridge 418. Secondary storage system 402 includes a secondary data bridge volume 420 and a primary status bridge volume 20 422. Volumes in each of the storage systems are designated for use in transferring data. As a result of this selection and configuration, primary data bridge volume 416, secondary status bridge volume 418, secondary data bridge volume 420, and primary status bridge volume 25 422 are reserved for internal use by the two storage systems 400 and 402.

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With the bridge volumes defined, two paths, data bridge path **424** and status bridge path **426** are established between primary storage system **400** and secondary storage system **402**. Data bridge path **424** begins at primary data bridge volume **416** in primary storage system **400** and ends at secondary data bridge volume **420** in secondary storage system **402**. Status bridge path **426** begins at primary status bridge volume **422** in secondary storage system **402** and ends at secondary status bridge volume **418** in primary storage system **400**.

Data bridge path **424** is used to transfer data from primary data bridge volume **416** to secondary data bridge volume **420**, while status bridge path **426** is used to transfer status information from primary status bridge volume **422** to secondary status bridge volume **418**. Data written to volumes **404-408** are transferred to corresponding volumes **410-414**. In the depicted examples, the data is in the form of tracks that are copied from a primary volume to a secondary volume.

Data from different volumes in primary storage **400** are queued at primary data bridge volume **416** and transferred to secondary data bridge volume **420**. From secondary bridge volume **420**, the data is relocated to the corresponding volume of the pair in secondary storage **402**. This relocating step with virtual volumes involves converting and saving the data to the target volume. Converting means changing the track identifier from the

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- bridge volume to the correct target volume. For example, data transferred from a volume, such as volume **404** to volume **410**, is transferred using primary data bridge volume **416** and secondary data bridge volume **420**. The
- 5 data is transferred from volume **404** to primary data bridge volume **416**. This data is then transferred using data bridge path **424** to secondary data bridge volume **420**. When the data is received at secondary data bridge volume **420**, the data is then converted and saved to volume **410**.
- 10 If data is to be transferred from volume **406** to volume **412**, the same data path, data bridge path **424** may be used.

15 Status information is sent from volume **420** and queued on primary status bridge volume **422**. After the status information is received on primary status bridge volume **422**, status information is returned using status bridge path **426**. No requirement is present for status information to be received confirming the writing of data to a secondary volume before data from a primary volume

20 can be written to a corresponding secondary volume. In other words, the transfer of data and the return of status information may occur asynchronously.

25 In transferring tracks of data from a primary volume to a corresponding secondary volume, the target volume is identified such the data can be relocated to the correct volume once received at the secondary data bridge volume.

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5       **Figure 5** is a block diagram of a mass storage system which operates with shared catalogues in accordance with a preferred embodiment of the present invention. Mass storage system represents the current framework in which cartridges are shared. Sharing cartridges in multiples library storage modules (LSMs) within an automatic cartridge system (ACS) has a shared control data set in an automated cartridge system library server (ACSLS) or a third party catalogue.

10       In this example, mass storage system **500** is an exemplary automated cartridge system (ACS). The ACS is designed to operate with an IBM or IBM-compatible host computer capable of communication with a conventional 327X-type terminal controller. Comprised generally of a 15       library management unit (LMU) **510** and a library storage modules (LSM) **518** and **520**, mass storage system **500**, through its associated host software component (HSC), enables storage and retrieval of magnetic tape cartridges for use by a host computer across a conventional channel.

20       LMU **510** serves as the library controller and provides the interface between from one to sixteen host computers and up to 16 LSMs.

25       Mass storage system **500** consists of LAN/WAN input signal **502** and LAN/WAN input signal **504** providing input into automated cartridge system library server **506**. Connected to ACSLS **506** is data control set (CDS) **508**. As input signals **502** and **504** are received by automated

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cartridge system library server 506, automated cartridge system library server 506 updates control data set 508. When a cartridge is requested by a host, automated cartridge system library server 506 searches the catalogue 5 which may be maintained on control data set 508. Automated cartridge system library server 506 may determine the tape cartridge system location in the library row slot and then may instruct a robot (not shown) to fetch the tape cartridge and transport the tape 10 cartridge to an assigned location, such as, for example a tape drive, a pass-through port and the like. ACSLS 506 separates input signals 502 and 504 into control information signal 522 and data signals 514 and 516. Control information signal 522 is sent to library 15 management unit 510. Library process control information 522 and transmits the processed control information 522 via control path 512 to library service modules 518 and 520. Library management unit 510 instructs the robot to move a tape cartridge from a first location to a second 20 location. Library management unit 510 may be a TCP/IP protocol. Control information 522 is used to instruct the robot to transport a cartridge from a first location to a second location. In addition, the robot may be constantly updating control data set 508 as to the status of every 25 robotic movement. This updating is done in the event of a power outage and therefore the robot would have up to date

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information as to the status of every tape cartridge in transit.

In addition, data signal **514** and data signal **516** are transmitted from ACSLS **506** to LSMs **518** and **520**. Data signals **514** and **516** may be transmitted over the same path but are independent of each other. There may be two signals. The first is control information signal **522** and data transfer signals **514** and **516**. Data signals **514** and **516** may only carry user data. Both control information **522** and data signals **514** and **516** may be transmitted over a WAN/LAN connection. However, ACSL server **506** separates LAN/WAN input signal **502** into control information signal **522** and data signals **514** and **516**.

**Figure 6** is a block diagram of a mass storage system which operates with separate catalogues in accordance with a preferred embodiment of the present invention. In this example, LAN/WAN input signal **602** is input into ACSLS **606** while LAN/WAN input signal **604** is input into ACSLS **610**. In addition, both ACSLS **606** and ACSLS **610** have dedicated control data sets **608** and **612**, respectively. ACSLS **606** and **608** receive their input signals and provide separate and discrete control information signals and data signals. For example, ACSLS **606** receives LAN/WAN input signal **602**, splits LAN/WAN input signal **602** into control information signal **632**, which is transmitted to LMU **616**, and data signal **614**. LMU **616** processes control information signal **632** and outputs processed control information signal **632**.

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via control path 618. Both processed control signal 632 and data 614 originating from LAN/WAN input signal 602 are input into LMU 620. Likewise, ACSLS 610 receives LAN/WAN input signal 604, splits LAN/WAN input signal 604 into 5 control information signal 634, which is transmitted to LMU 624, and data signal 622. LMU 624 processes control information signal 634 and outputs processed control information signal 634 via control path 626. Both processed control signal 634 and data 622 originating from 10 LAN/WAN input signal 604 are input into LMU 628.

In this example, pass-through port 630 is designed to transport tape cartridges from library service module 620 to library service module 628 in either direction. Pass-through port 630 may be used when a tape cartridge is in a 15 library service module, such as, for example, library service module 620 or 628 when all tape drives are in use. ACSL server 606 or 610 may look for the closest available tape drive and initiate a pass-through command to a targeted library service module and a tape drive.

20 A pass-through port may be manufactured in three sections (not shown) which may include a master receiver tower, a draw bar arm assembly and a slave receiver tower. The master receiver tower is called the master since it supplies power to the entire pass-through port assembly.

25 Tape cartridge movement may be as follows. The robot places a pass-through port cartridge in the master receiver tower. Once in the master receiver tower, the

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tape cartridge slides down a drop ramp onto a draw bar path located on the draw bar arm. The draw bar arm transports the tape cartridge along the draw bar path where it encounters a tumble block which rotates the tape

5 cartridge, for example, 180 degrees, so that the tape cartridge is properly oriented for a receiving robot. At this point, the receiving robot is notified that a cartridge needs to be removed from a "GET" port. The GET port is located at the end of the draw bar path of the

10 targeted tape cartridge. The GET port is where the robot fetches the tape cartridge from the pass-through port. For the present invention implementing a secure gateway, only the master receiver tower and the draw bar arm may be needed. Therefore, by eliminating the slave receiver

15 tower it may be ensured that a tape cartridge is never sent back to the sending library service module.

**Figure 7** is an exemplary flowchart illustrating a gateway pass through port (GPTP) in accordance with a preferred embodiment of the present invention. In this

20 example, the operation starts by creating a tape cartridge (step 702). Then a determination is made as to whether or not a copy of the tape is needed for a secure automatic cartridge system (step 704). If a copy of the tape is not needed for a secure automatic cartridge system (step

25 704:NO), there will be no gateway pass-through performed (step 706) and thereafter the operation terminates. If a copy of the tape is needed for a secure automatic

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cartridge system (step 704:YES), a copy of the tape is created (step 708). An identification qualifier is added to the copy of the tape (step 710). An identification qualifier may be, for example, a copy serial number range 5 or a separate serial number range. Then a determination is made as to whether or not the software recognizes the tape copy (step 712). The software may be invoked to handle the move request. If the software does not recognize the tape copy (step 712:NO), the operation 10 terminates. If the software does recognize the tape copy (step 712:YES), the gateway pass-through is initiated (step 714).

Then a request is made for a copy of the tape by the software (step 716). The tape cartridge is then received 15 from the robot (step 718). The tape cartridge copy is then placed into the Master Receiver Tower (step 720). The control data set is then updated (step 722). The control data set may be part of the ACSL server disk or may be external to the ACSL server. The control data set 20 is a catalogue of every movement of tape cartridges in the library service module. The control data set may be created and managed by the ACSL server. The tape cartridge is then moved from a GET port for the destination ACS (step 724) and thereafter the operation 25 terminates.

**Figure 8** is an exemplary flowchart illustrating a source automatic cartridge system in accordance with a

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preferred embodiment of the present invention. In this example, the operation begins with a determination as to whether or not the source ACS places the tape cartridge into the GET port (step 802). If the source ACS does not 5 place the tape cartridge into the GET port (step 802:NO), the operation terminates. If the source ACS does place the tape cartridge into the GET port (step 802:YES), the microcode directs the tape cartridge in the GET port (step 804). The microcode may be resident in the library 10 control unit. A microswitch in a drop ramp may simulate a cartridge access port door open and close (step 806). A mounting plate may contain at least two microswitches that are mounted in the tape cartridge path such that when the tape cartridge reaches the GET port the microswitches 15 toggle (step 808). One microswitch is connected to a source LCU and the other microswitch is connected to a destination LCU. The tape cartridge is then decatalogued from the source ACS (step 810). Once the cartridge is placed in the Master Tower Server (step 812), the ACSL 20 server is notified that the tape cartridge has been ejected (step 814). The control data set is then updated to reflect that the tape cartridge has been ejected (step 816) and thereafter the operation terminates.

**Figure 9** is an exemplary flowchart illustrating a 25 destination automatic cartridge system in accordance with a preferred embodiment of the present invention. In this example, a determination is made as to whether or not a

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sensor connected to the GET cell has notified the destination LCU that a tape cartridge needs to be inserted into the LSM (step 902). The sensor may be a microswitch that is tripped when the tape cartridge is moved into the 5 GET port. If the sensor connected to the GET cell has not notified the destination LCU that a tape cartridge needs to be inserted into the LSM (step 902:NO), the operation terminates. If the sensor connected to the GET cell has notified the destination LCU that a tape cartridge needs 10 to be inserted into the LSM (step 902:YES), the tape cartridge is processed the same as if a tape cartridge was entered into a cartridge access port (step 904). To transfer a tape cartridge into the library service module, an operator may enter a command to the ACSL server via a 15 master terminal to unlock the cartridge access port (step 906). When the tape cartridge is moved to the cartridge access port, a library control unit unlocks the cartridge access port (step 908). When a door to the cartridge access port is closed, the library control unit senses the 20 closing of the door to the cartridge access port (step 910) and this initiates the robot to retrieve the tape cartridge (step 912).

Then an operator is prompted to insert a tape cartridge (step 914). The ACSL server may prompt an 25 operator to either mount the tape cartridge in a tape drive or catalogue the tape cartridge into the library service module for future reference. The insertion point

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is the GET port for the secure gateway. Then a determination is made as to whether or not the tape cartridge is inserted (step 916). If the tape cartridge is not inserted (step 916:NO), the operation terminates.

5        If the tape cartridge is inserted (step 916:YES), the robot is instructed to retrieve the tape cartridge (step 918). Then a determination is made as to whether or not the tape cartridge is retrieved from the GET port (step 920). If the tape cartridge is not retrieved from the GET  
10      port (step 920:NO), the operation terminates. If the tape cartridge is retrieved from the GET port (step 920:YES), the tape cartridge is catalogued into the destination ACS control data set (step 922) and thereafter the operation terminates.

15      Therefore, the present invention provides an improved method and apparatus for an addressing security issues of transmission of data between an unclassified and classified network. The present invention also provides an improved method and apparatus for allowing  
20      the expansion beyond sixteen library storage modules without major revisions to the host software component (HSC).

25      The description of the present invention has been presented for purposes of illustration and description, but is not intended to be exhaustive or limited to the invention in the form disclosed. Many modifications and variations will be apparent to those of ordinary skill in

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the art. For example, transferring tape cartridges from one automated tape cartridge system to another automated tape cartridge system was described. However, any type of data storage unit may be used in implementing the

5 present invention, such as, for example, CD-ROMS, DVDs and the like. The embodiment was chosen and described in order to best explain the principles of the invention, the practical application, and to enable others of ordinary skill in the art to understand the invention for

10 various embodiments with various modifications as are suited to the particular use contemplated.